

AOCS Long Beach 2012

# The Science of Traceability

## *Implications to Bulk Product Chains*

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# Agenda

- About SINTEF Fisheries and Aquaculture (SFH)
- SFH's background in Traceability Research
- Traceability drivers
- State of the art
- Challenges
- Bulk food traceability
- Examples
  - eTrace
  - MSTJ
  - eSporing
- Applications of traceability

# SINTEF Fisheries and Aquaculture



# SINTEF Fisheries and Aquaculture

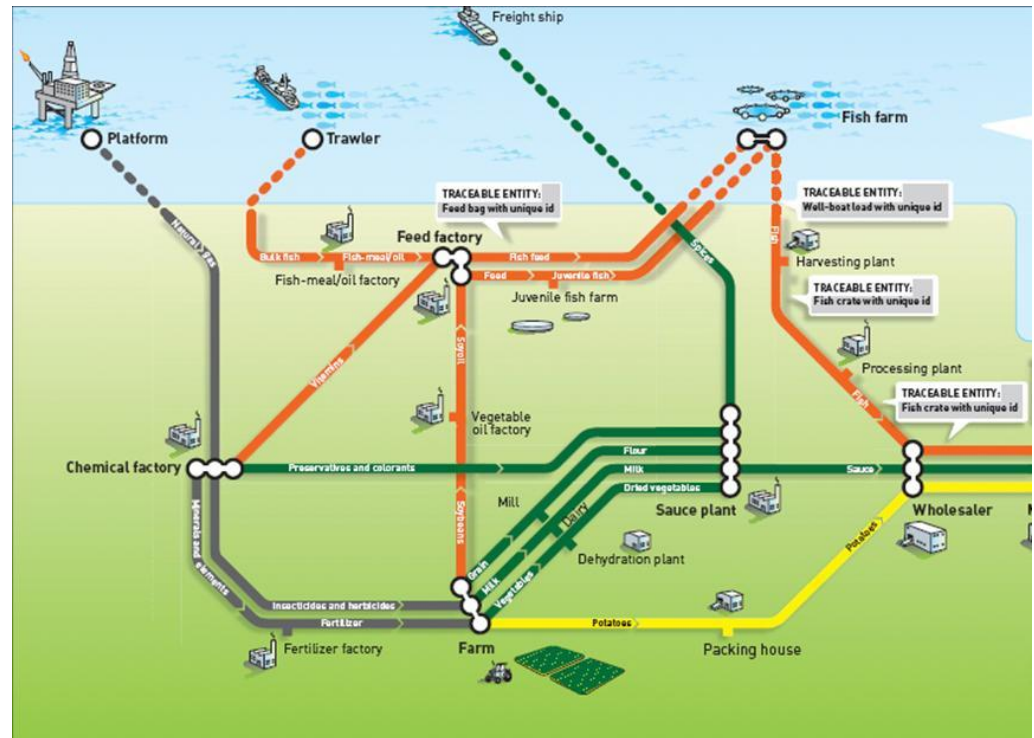
**SINTEF** is the largest independent research organization in Scandinavia. SINTEF is a broadly based, multidisciplinary research concern that possesses international top-level expertise in technology, medicine and the social sciences.

**SINTEF Fisheries and Aquaculture** located in Trondheim, Norway represents the technological expertise in the utilization of renewable marine resources. Under the vision "Technology for a better society" we are working for a knowledge-based bio marine industry.



# Traceability and SFH

- TRACE
- eTrace
- eSporing
- MainSafeTrace
- TraceFish
- ??
- 

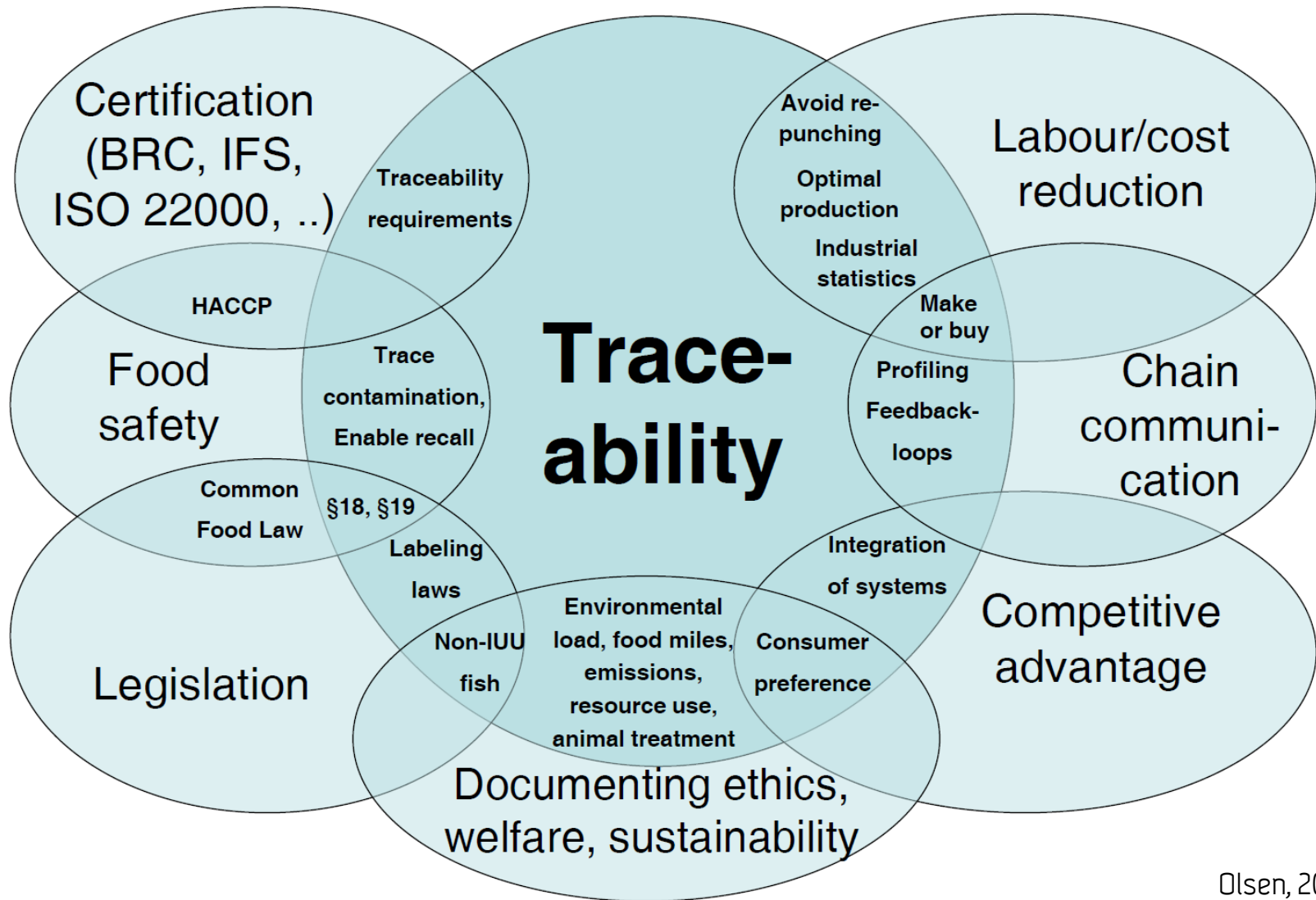




# What is Traceability?

- **ISO 8402:** the ability to trace the history, application or location of an entity by means of recorded identifications
- **EU General Food Law:** the ability to track any food, feed, food producing animal or substance that will be used for consumption, through all the stages of production, processing and distribution
- **ISO 22005 Food Traceability Standard:** states that each company know who their immediate supplier is and to whom the product is being sent, based on the principle of one up and one down
- **Food Safety Modernization Act**

# Traceability Drivers in the Food Sector



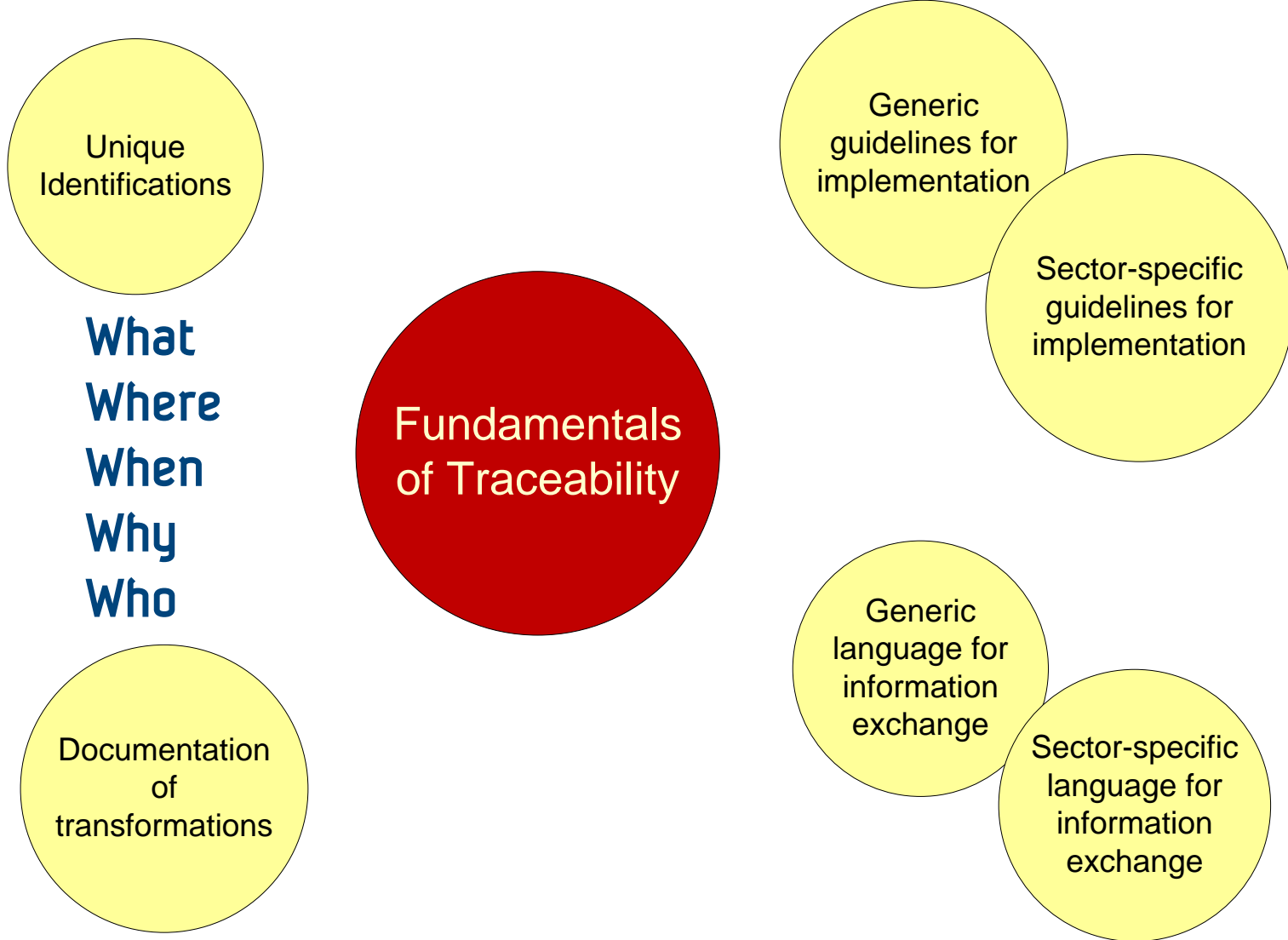
Olsen, 2009

# Past Activities

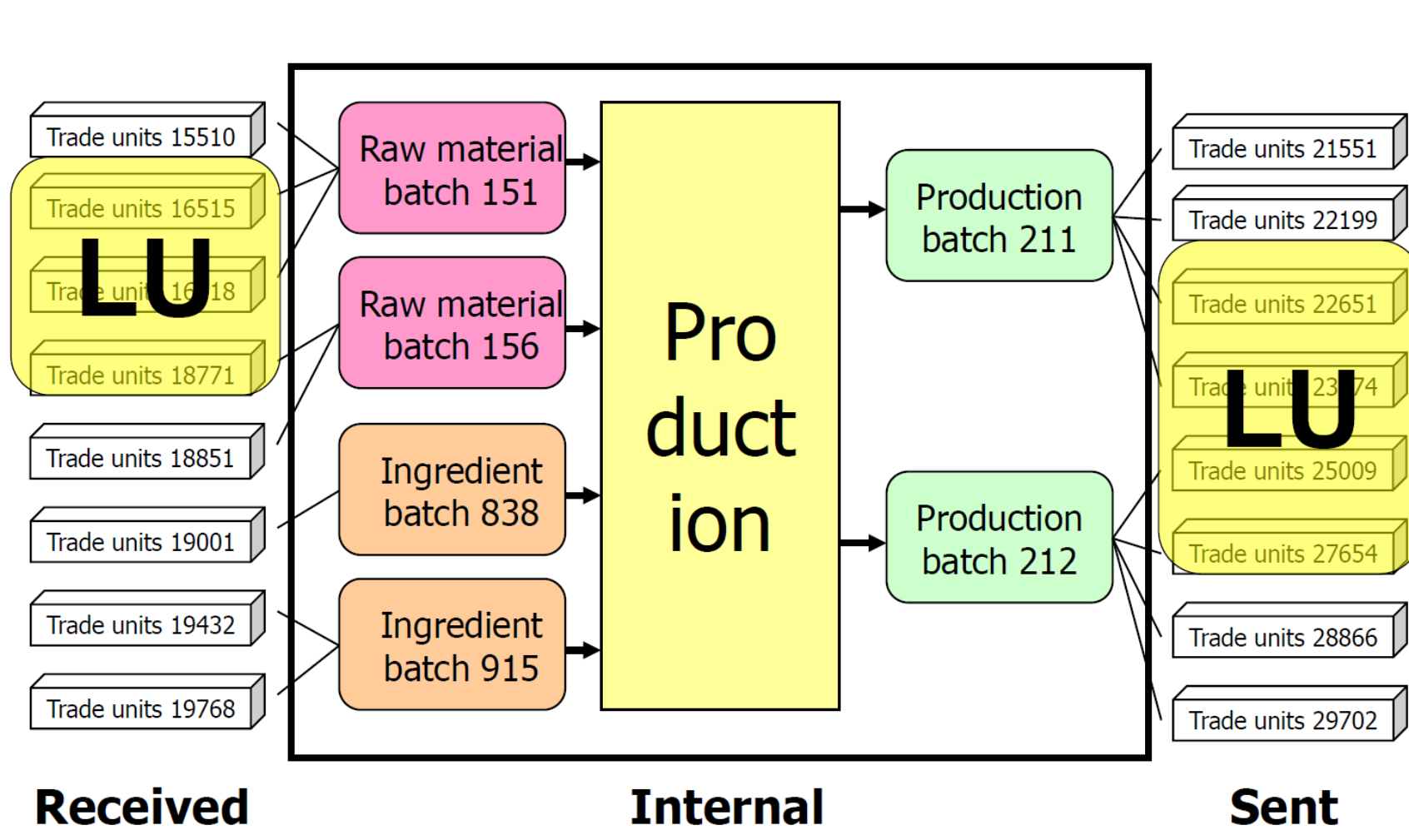
- TraceFood Framework
- Good Traceability Practices
- Sector specific standards
- TraceFish standard – ISO
- Process Mapping
- Internal and Chain traceability definitions



# Fundamentals of Traceability

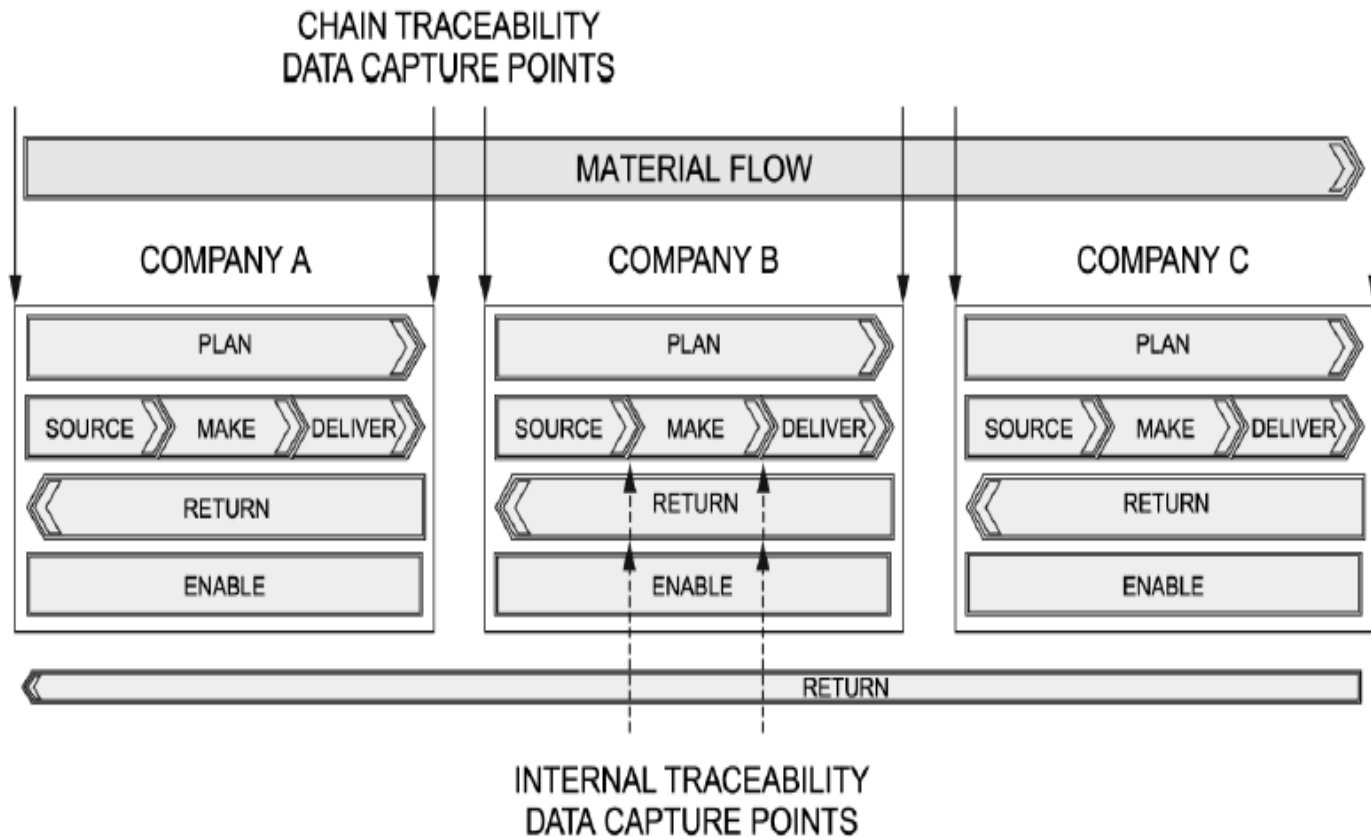


# Batches, TUs and LUs



Olsen, 2009

# Internal and Chain Traceability

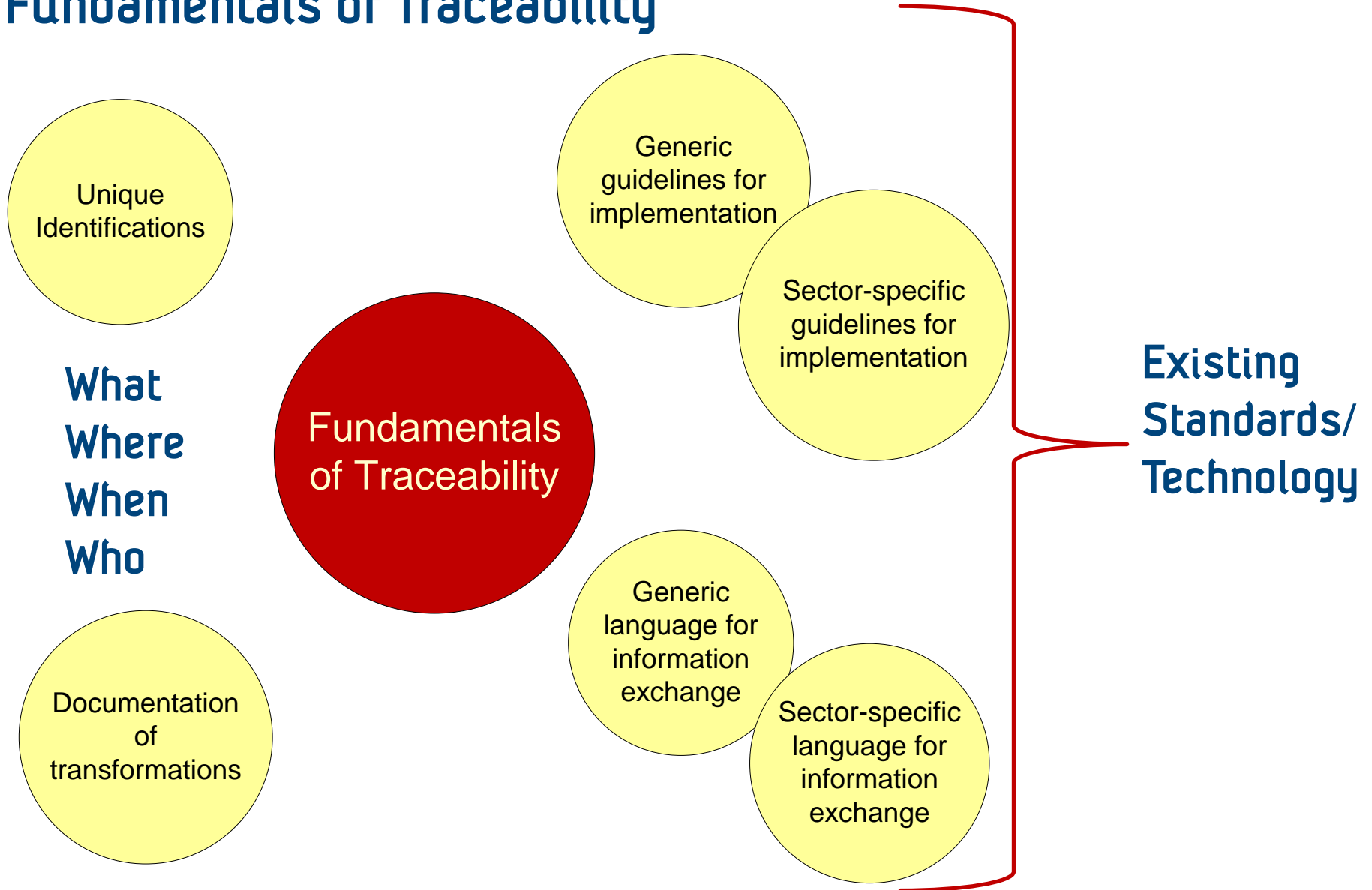


Senneset et al., 2007

# Food Chain Characteristics

- Difficult to define Traceable Unit
- Several transformations throughout the chain: merging, splitting, etc.
- Manual data handling
- Absence of sophisticated IT systems for data management
- Data exists in several stand-alone applications, usually Excel spreadsheets or paper format

# Fundamentals of Traceability



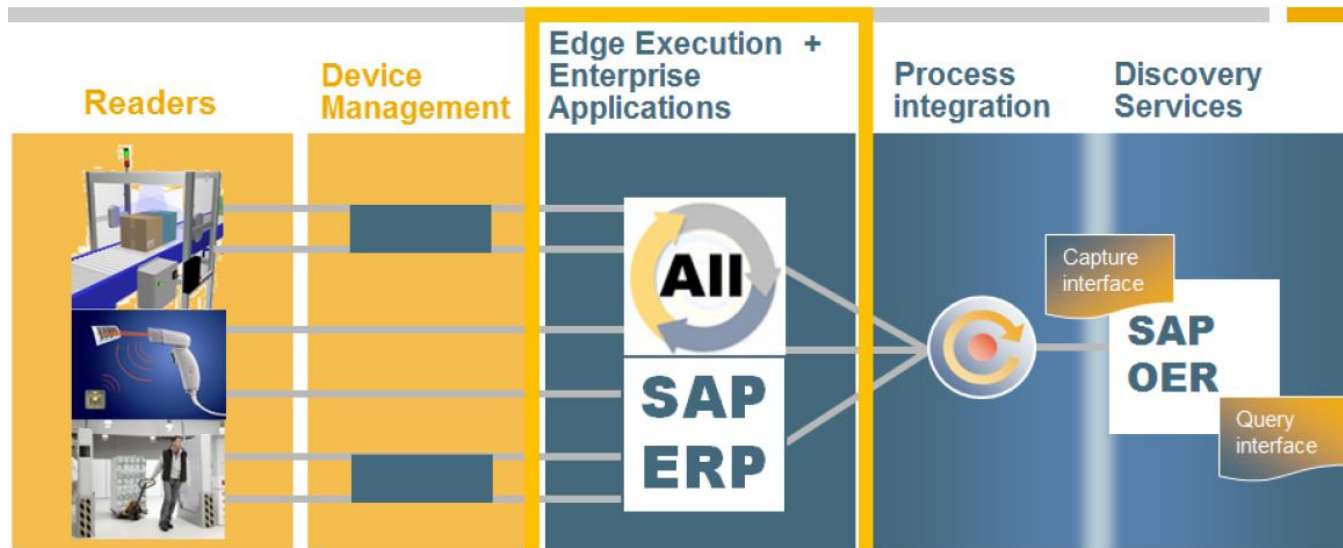
# EPCIS based traceability solutions

## *Examples of Implementation*



# EPCIS - Electronic Product Code Information Services

- **Electronic Product Code (EPC)** is a **universal identifier** that provides a **unique identity** for every physical object anywhere in the world. It was designed to establish a global unique object identifier which was made possible through the use of **RFID – Radio Frequency Identification**
- EPC Information Services (**EPCIS**) is an EPCglobal standard designed to enable EPC-related **data sharing within and across enterprises**.



GS1, 2011

# EPCIS

- Event based approach

EPC Events answer 4 questions –***What, Where, When, and Why***

## What

- EPC number (can leverage master data - GTIN)
- Manufacturing Data (lot, batch, expiration date)
- Transactional Data (PO, Shipment, Invoice)

## Where

- Location (can be fixed or moving – leverage master data - GLN)

## When

- Event Time
- Record Time

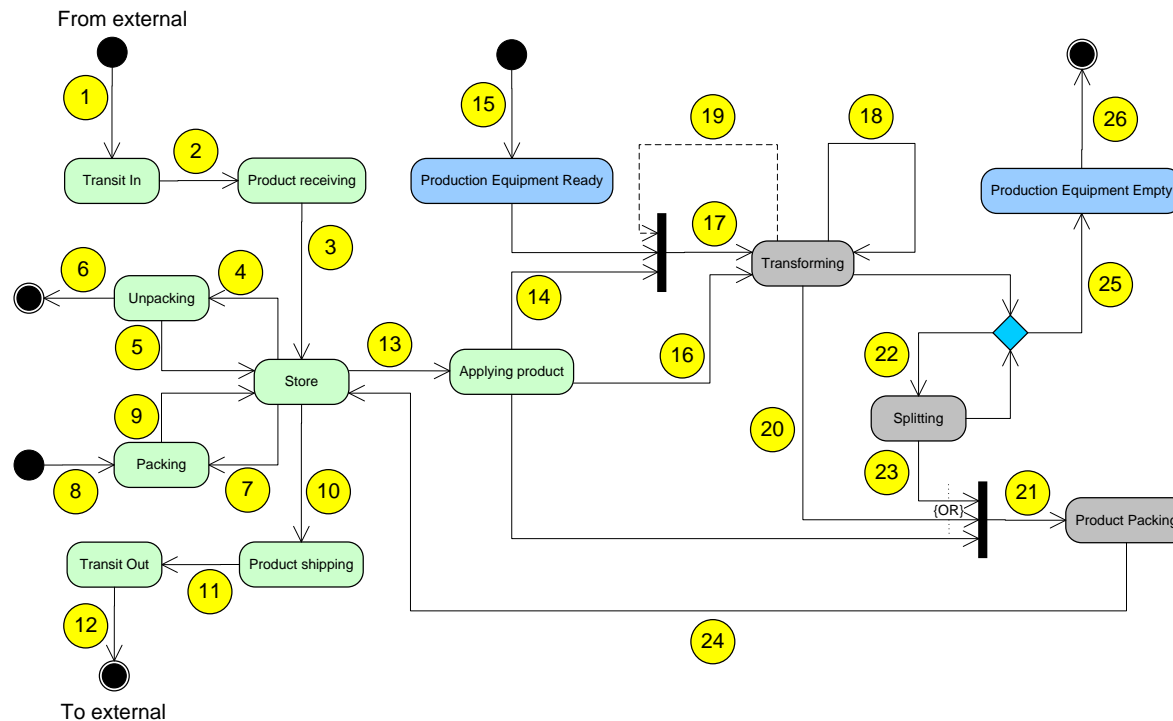
## Why

- Business Process Step – e.g.: Receiving, Shipping
- Product State – e.g.: Saleable, Active, In Transit
- Current Conditions – e.g.: Temperature

GS1, 2011

# EPCIS and Food Traceability

- Identify states and events in food production
- Mapping of these events to the EPCIS standard



# eTrace Project

- **Objective:** To develop and evaluate an electronic traceability system based on the EPCIS standard by enabling automatic data capture related to tagged items
- Pilot studies were conducted to test the applicability of the traceability system designed based on the EPCIS standard
- Two pilot studies in fish supply chains:
  - Cod (from the Baltic Sea) in Sweden
  - Red fish in Iceland
    - Temperature integration

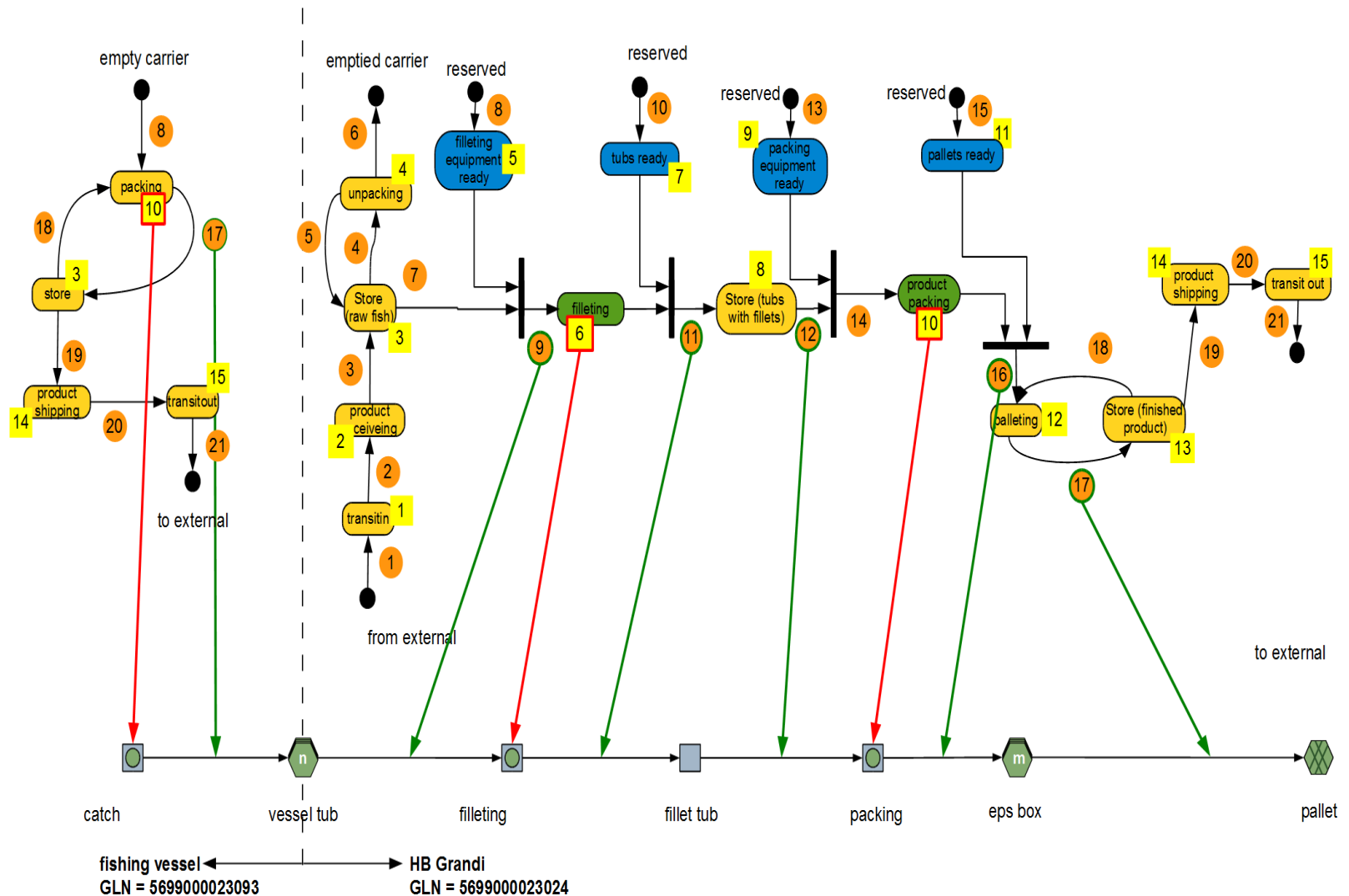


# eTrace Project

- Fish catch labeled with RFID tags and read using handheld RFID readers as product moved through production



# States and Events in Production





# Event Data

```
<ObjectEvent>
<eventTime>2011-03-19T10:38:00+00:00</eventTime>
<eventTimeZoneOffset>+00:00</eventTimeZoneOffset>
<epcList>
<epc>urn:gtnet:id:batch:etrace-icefish.catch.19032011</epc>
</epcList>
<action>ADD</action>
<bizStep>urn:epcglobal:cbv:bizstep:stocking</bizStep>
<disposition>urn:epcglobal:cbv:disp:sellable_accessible</disposition>
<bizLocation>
<id>urn:epc:id:sgln:5699000023.09.010</id>
</bizLocation>
<gtnet:entityClass>Batch</gtnet:entityClass>
<gtnet:trdType>catch</gtnet:trdType>
<ttdata:fishingmethod>trawl</ttdata:fishingmethod>
<ttdata:vesselname>Ásbjörn RE 50</ttdata:vesselname>
</ObjectEvent>
```

} associating with TRD

} attributes

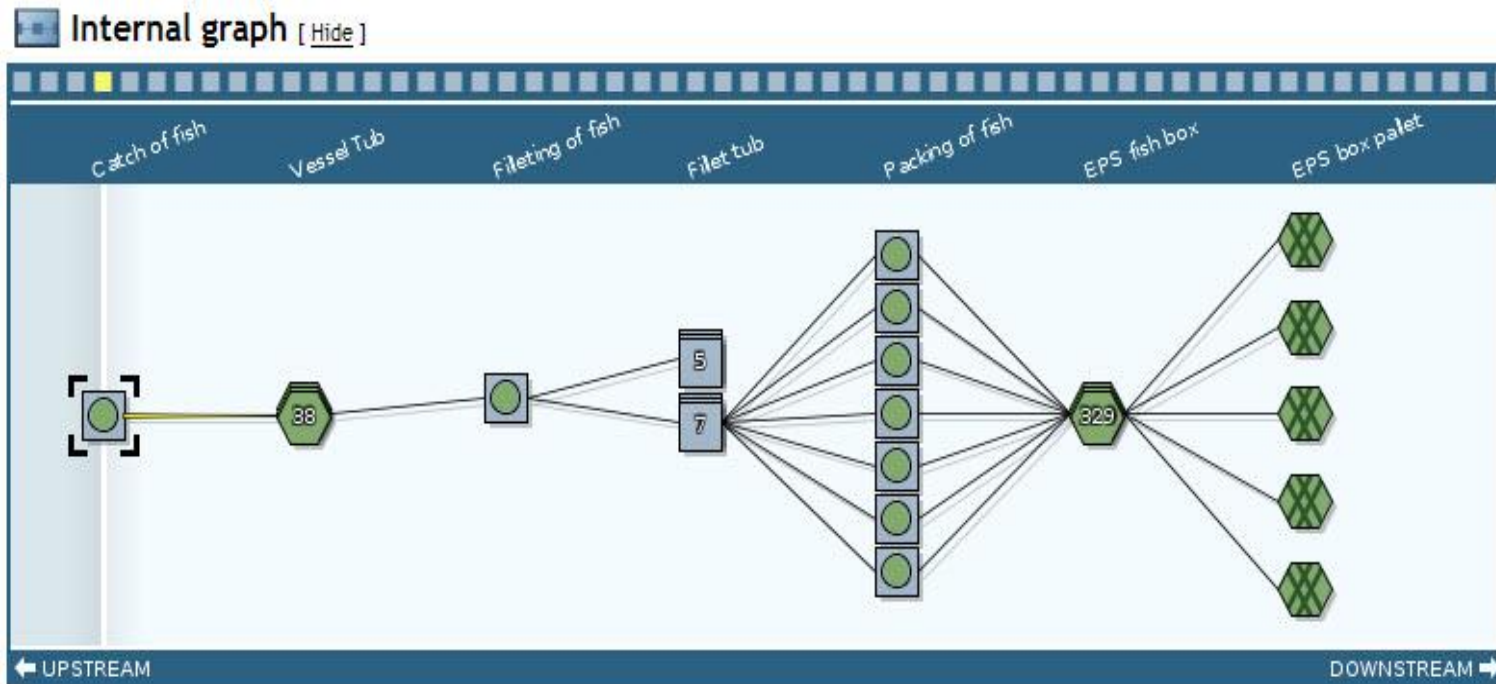
# Transformations mapped to EPCIS

	event	action	bizStep	parentID	childEPCs	epcList	extension
<b>mix</b>	AE	ADD	transforming	destination	source(s)		
<b>split</b>	AE	DELETE	transforming	source	destination(s)		
<b>entercluster</b>	AE	ADD	packing	destination	source(s)		
<b>leavecluster</b>	AE	DELETE	unpacking	source	destination(s)		
<b>sentto</b>	OE	OBSERVE	shipping			ID(s)	receiving TIX
<b>receivedfrom</b>	OE	OBSERVE	receiving			ID(s)	sending TIX

AggregationEvent = AE

ObjectEvent = OE

# Traceability graph



# Traceability data

TT Navigator - Stage EPCIS - eTrace 2 - Windows Internet Explorer

https://stage-epcis.tracetracker.com/tix/etrace2/app/getTransformationTree?localc...

File Edit View Favorites Tools Help

Convert Select

Google restaurant

Google Oversetter#ennow... Web Slice Gallery Google Oversetter#ennow...

Gmail - Priority In... Queen's Universit... Google Overette... TT Navigator ...

Page Safety Tools

tracetracker

TT NAVIGATOR Bruker: etrace

Stage EPCIS eTrace 2

Trace & track Vis grafer Data håndtering Administrasjon Mine brukerdetaljer Hjelp Skriv ut side Logg ut

Intern sporbarhetsgraf [ Skjul ]

Catch of fish Vessel Tub Filing of fish Filet tub Packing of fish EPS fish box EPS box pallet

OPPSTRØMS NEDSTRØMS

Symbol forklaring Full Størrelse

EPS box pallet - urn:epc:id:grai:5699000023.77.50 [ Skjul ]

Detalj	Verdi	Rapporter
Id	urn:epc:id:grai:5699000023.77.50	Tabell over avhengigheter
Type	EPS box pallet	Leverandører og Kunder
Beskrivelse	Pallet with fish in EPS boxes	Entitets egenskapsverdi logg
Trade Unit-klasse	Klynge	Oppstrøms Tus
MISSING:ItemRef	urn:epc:id:grai:5699000023.77.*	Stasjonslogg for batch eller tu
Tidspunkt	27.10.10 10:51	Verktøy
		Logg
		Data eksport

Egenskaper [ Skjul ]

Egenskap	Verdi	Egenskap	Verdi
Airway bill	290-3026-1630	disposition	urn:epc:global:cbv:disp:sellable_not_accessible
Enter KEF cooling	27.10.10 16:01	Enter local storage	27.10.10 11:21
Leave local storage	27.10.10 15:01	Start KEF transport	27.10.10 15:01
Stop KEF transport	27.10.10 16:01		

Rediger

Transformasjoner [ Skjul ]

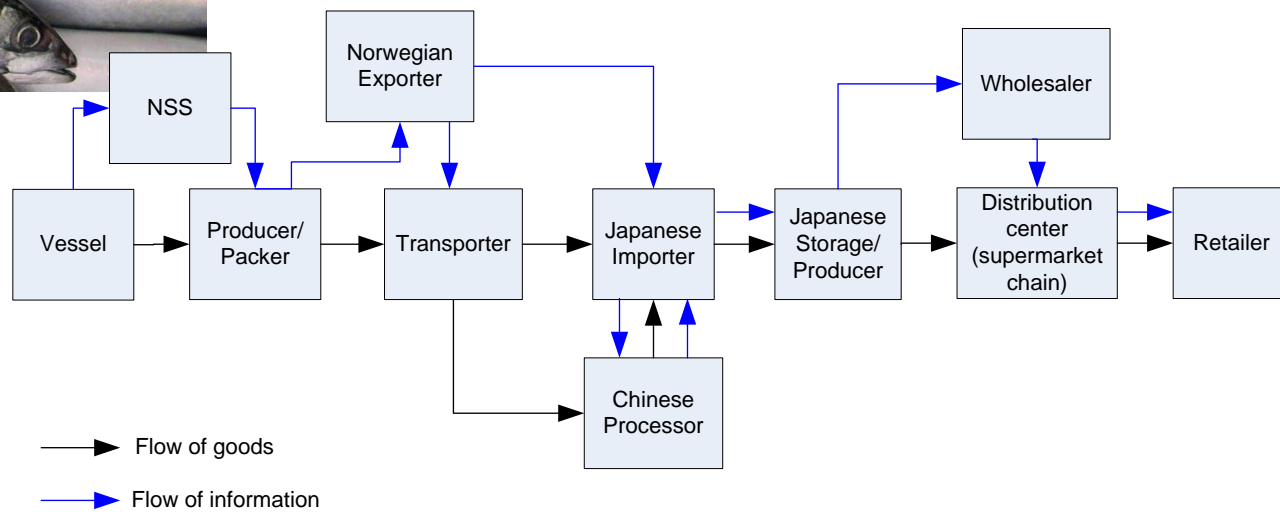
Fra	Type	Til	Tidspunkt
urn:epc:id:sgtin:5699000023.333.185	Inn i klynge	urn:epc:id:grai:5699000023.77.50	27.10.10 11:05
urn:epc:id:sgtin:5699000023.333.186	Inn i klynge	urn:epc:id:grai:5699000023.77.50	27.10.10 11:05
urn:epc:id:sgtin:5699000023.333.187	Inn i klynge	urn:epc:id:grai:5699000023.77.50	27.10.10 11:05
urn:epc:id:sgtin:5699000023.333.188	Inn i klynge	urn:epc:id:grai:5699000023.77.50	27.10.10 11:05
urn:epc:id:sgtin:5699000023.333.189	Inn i klynge	urn:epc:id:grai:5699000023.77.50	27.10.10 11:05
urn:epc:id:sgtin:5699000023.333.206	Inn i klynge	urn:epc:id:grai:5699000023.77.50	27.10.10 11:05

Internet | Protected Mode: On

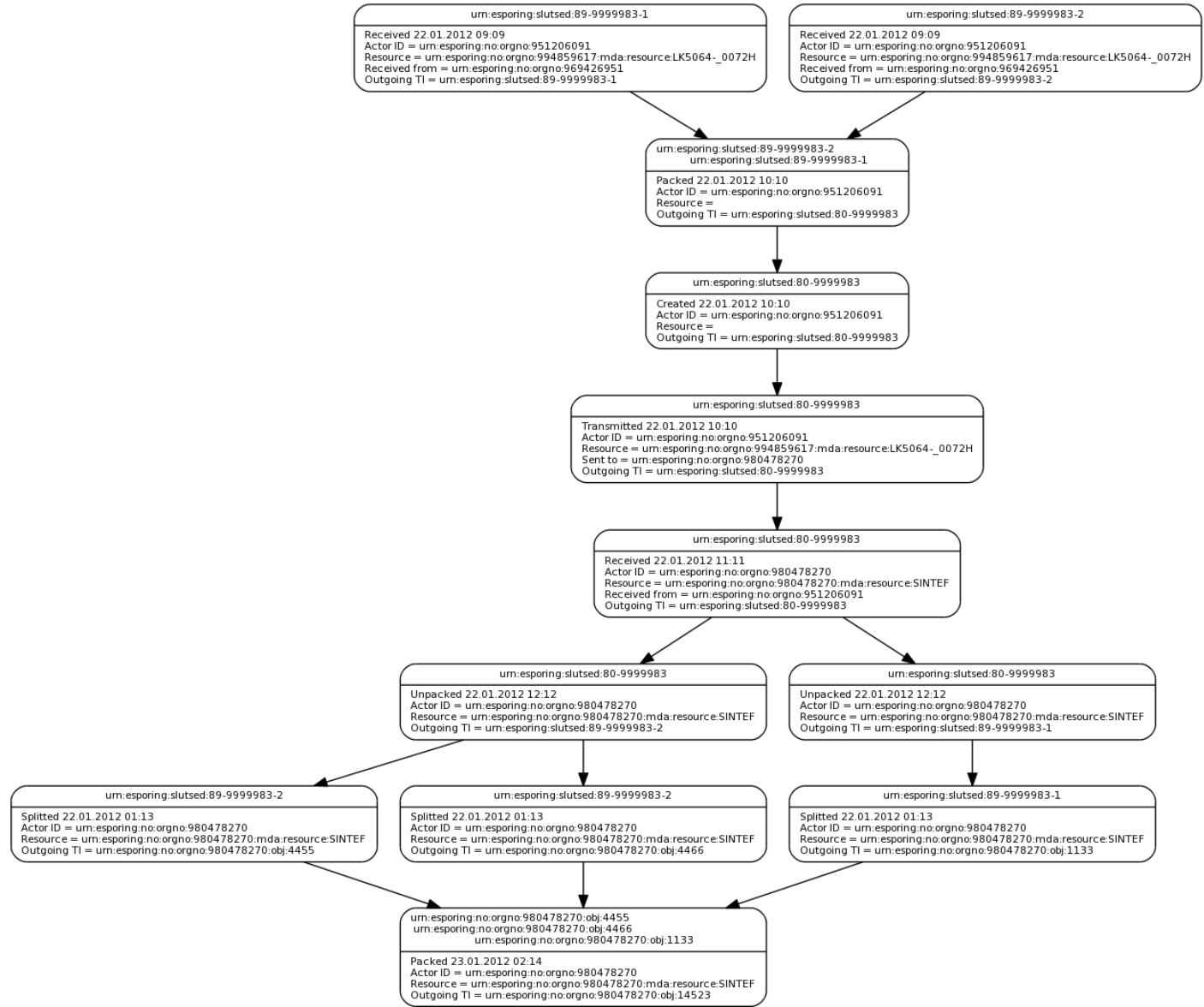
100%

# MainSafeTrace Project

- This project aims to develop, test and measure the effect of a tailor made traceability system with functionality for recording and sharing food safety related information in the mackerel supply chain between Norway and Japan



# Traceability C





# Challenges

- **ISO 8402:** the ability to trace the history, application or location of an entity by means of recorded identifications
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